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IN THE

# Supreme Court of the United States

October Term, 1938

No. 127

MACKAT RADIO AND TELEGRAPH COMPANY, INC.

*Petitioner,*

vs.

RADIO CORPORATION OF AMERICA,

*Respondent.*

## BRIEF FOR PETITIONER.

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MACKAY RADIO AND TELEGRAPH COMPANY, INC.,

*Petitioner,*

*vs.*

RADIO CORPORATION OF AMERICA,

*Respondent.*

**BRIEF FOR PETITIONER.**

This is a patent infringement suit, here on writ of certiorari to the Circuit Court of Appeals for the Second Circuit.

**Opinions of the Courts Below.**

The opinion of the District Court for the Eastern District of New York is reported in 16 Fed. Supp. 610 (Vol. II, p. 1133).

The opinion of the Court of Appeals is found in 96 Fed. (2d) 587 (Vol. II, p. 1167).

**Jurisdiction.**

The date of the judgment to be reviewed is May 2, 1938.

The writ of certiorari was granted by this Court on October 10, 1938. The jurisdiction of this Court is invoked

under Judicial Code 240-A, as amended by the Act of February 13, 1935.

The cases believed to sustain the jurisdiction are:

*The Barber Asphalt case*, 302 U. S. 458;  
*Paramount Publix Corp. v. American Tri-Ergon Corp.*, 294 U. S. 464;  
*Altoona Publix Theatres Inc. v. American Tri-Ergon Corp.*, 294 U. S. 477;  
*Carbice Corp. v. American Patents Development Corp.*, 283 U. S. 27;  
*DeForest Radio Co. v. General Electric Co.*, 283 U. S. 664.

#### **Assignment of Errors.**

The errors which petitioner urge are:

- (1) The Circuit Court of Appeals erred in sustaining Carter Patent No. 1,974,387 as valid and infringed.
- (2) The Court of Appeals erred in overruling every essential finding of fact of the District Court with respect to the issues relevant to the Carter patent, without authority in or reference to the evidence.
- (3) The Court of Appeals erred in failing to affirm the District Court on the facts found by that Court and established by the record, that the Carter Patent No. 1,974,387 is invalid because of unlawful amendment to its statement, description and claim of invention.
- (4) The Court of Appeals erred in failing to affirm the District Court's finding of fact that petitioner's antenna structures, charged to infringe, differ "radically" "in structure, principle of operation and instrumen-

talities" from that of the patent, and operate on principles not only different from those of the patent but "contradictory thereto as well".

(5) The Court of Appeals erred in failing to hold Carter Patent No. 1,974,387 invalid as completely anticipated by and wanting in invention over the prior art.

#### Statement of the Case.

1. Petitioner is a public service corporation engaged, with its associated companies, in the radio transmission of public telegraph messages between the principal cities of the United States and with foreign countries. In this respect petitioner, and its associated companies, constitute the only competition to the world-wide public radio telegraph service operations of respondent and its subsidiary, RCA Communications.

2. Respondent, Radio Corporation of America, is a member of the radio patent pool.<sup>1</sup>

3. Under the patent pool the various "fields" of the electrical industry were allocated to the respective members thereof. Thus, to American Telephone and Telegraph Company was allocated the *telephone* communications field, and the *talking motion picture* field was jointly shared by respondent and American Telephone and Telegraph Company.<sup>2</sup> To respondent alone was allocated the field of world-wide *radio telegraph communication*.

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<sup>1</sup> See—*Lord v. Radio Corporation of America*, 24 Fed. (2) 565; *Radio Corporation of America v. Lord*, 28 Fed. (2) 257; *Lord v. Radio Corporation of America*, 35 Fed. (2) 962; *Radio Corporation of America v. de Forest*, 47 Fed. (2) 606.

<sup>2</sup> *Stanley Company of America v. American Telephone & Telegraph Co., General Talking Pictures Corp. v. American Telephone & Telegraph Co., Duovac Radio Corp. v. American Telephone & Telegraph Co.*, 4 Fed. Supp. 80; *Same v. Same*, 18 Fed. Supp. 650.

4. The present suit is an effort on the part of respondent to eliminate competition in public service world-wide radio telegraph communications.

5. Respondent initially filed suit charging petitioner with infringement of four patents (all included in the radio patent pool, see footnote 1, p. 3) having to do with various features of radio antennas and their operation. At the time the bill was filed, respondent had pending in the Patent Office, in the name of one Carter, an application for a *fifth* patent for an antenna structure. Subsequent to petitioner's answer in the suit, and after receiving particulars as to the structure and operation of petitioner's antennas, respondent completely altered the statement and claim of invention of the pending Carter application in the attempt to include petitioner's antenna structures.\*

6. Thereafter, the Carter patent issued (referred to in the litigation as the "Third Carter patent") and a supplemental bill of complaint was filed charging infringement thereof. The suits were consolidated, and the parties proceeded to trial on all five patents before Judge CAMPBELL in the Eastern District of New York.

7. After a trial which lasted nearly a month, Judge CAMPBELL filed an opinion finding as a fact, on the conflicting evidence before him, that petitioner's antennas differed

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\* The District Court found (Vol. II, p. 1154, fol. 1377) :

"The disclosure and the claims were broadened not only contrary to their original terminology but to their spirit as well";

and (p. 1155, fol. 1378) :

" \* \* \* by those amendments the plaintiff attempted to mold the third Carter patent both as to disclosure and claims, to cover defendant's antenna systems.

This could not lawfully be done."

"radically" from all of the patents "in structure, principle of operation and instrumentalities", and operated on principles not only *different* from those of the patents, but "contradictory thereto as well."<sup>4</sup> He also characterized the broadening amendment as unlawful, as above noted (Footnote 3, *ante*, p. 4).

8. The opinion of the District Judge showed such painstaking and thorough analysis of the evidence, and so clearly stated and decided the issues presented, after seeing and hearing the large number of witnesses of both sides testify on the facts and scientific principles involved, that counsel for petitioner and respondent stipulated that the opinion of the Court be accepted as the findings of fact and conclusions of law in the case in compliance with the provisions of Equity Rule 70-1/2 (Vol. II, p. 1158). In consequence, a

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<sup>4</sup> The District Court found (Vol. II, p. 1145, fol. 1363) :

"The defendant's antennas which are charged with infringement differ *radically* from the inventions claimed in the three antenna patents in suit". (Italics ours.)

Again, the Court found (p. 1146, fol. 1364) :

"In substance all of the antenna patents in suit present merely a theoretical application of antenna wires in free space, whereas all of the defendant's are *intentionally* designed to cooperate with ground effect, which effect not only is not contemplated by any of the patents in suit, but is contradictory to the description and claims thereof." (Italics ours.)

Again, the Court found (p. 1151, fol. 1372) :

"Due to the departure from the Carter patent in the respects enumerated and by reason thereof in all of defendant's antennas, here charged to infringe, defendant obtains material advantages and increased efficiency in that material increase in radiated power is obtained." (Italics ours.)

and, finally, the Court found (p. 1157, fol. 1380) :

"\* \* \* the fact is, however, that defendant's systems are radically different from the patents in suit, in structure, principle of operation and instrumentalities, and were designed and constructed to secure and did secure greater radiation, by reason of such difference than could be obtained by the patents in suit." (Italics ours.)

final decree was entered dismissing the bills of complaint, as to all patents, for want of equity (Vol. II, p. 1158).

9. Respondent acquiesced in the decree dismissing the complaint as to three of the patents, but appealed from that decree as to two, namely, Lindenblad Patent No. 1,927,522 and the Third Carter patent here involved.

10. The appeal was argued April 8, 1938. On May 2, 1938 the Court of Appeals announced its decision (per Judge MANTON) holding the Carter patent valid and infringed. Thereby it, in effect, reversed every essential finding of fact made by the Trial Judge, although the Court of Appeals did not point out any error in such findings, or cite evidence in support of its contrary finding. It affirmed the District Court's dismissal of the Complaint as to the Lindenblad patent.

11. The case here before the Court, therefore, is confined to the Carter patent.

### Summary and Order of Argument.

Petitioner contends that the Carter patent is neither valid nor infringed, both as a matter of fact and of law.

#### A. As to want of infringement, petitioner asserts:

- (1) That the patent is not a pioneer patent; and that the record does not show that it has ever been employed by anyone. This was found as a fact by the Trial Judge.<sup>5</sup>

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<sup>5</sup> The Trial Judge found (Vol. II, p. 1156, fol. 1380):

"None of the patents in suit are pioneer patents, as contended by plaintiff, and the record does not show that they had been employed by anyone; even the plaintiff's own commercial structures do not follow the teachings or employ the instrumentalities shown, described or claimed in any of the patents in suit, as I have interpreted the same." (Italics ours.)

- (2) That petitioner's antennas, as was likewise found by the Trial Judge, differ "radically" from the Carter patent "in structure, principle of operation and instrumentalities", and operate on principles not only "not contemplated" by the Carter patent, but "contradictory to the description and claims thereof" as well.\*
- (3) That the Court of Appeals committed error in reversing every essential finding of fact made by the Trial Judge under such circumstances, especially where no error, manifest or otherwise, was pointed out; and where it is not even suggested (and could not be) that petitioner's evidence did not fully support the fact findings.

B. As to invalidity, petitioner asserts:

- (1) That the Carter application, while pending in the Patent Office, and after respondent had obtained knowledge of petitioner's antenna structures, was altered both as to statement and claim of its alleged invention, in the endeavor to include petitioner's antennas within its scope, in a manner, as found by the Trial Judge "not only contrary to their original terminology but to their spirit as well."\*\* This, as a matter of law, invalidates the patent, as the Trial Judge, in effect, held. (See footnote 3, *ante*, p. 4.)
- (2) The patent is also invalid as a matter of law because the *amended* statement and claim of invention

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\* See footnote 4, *ante*, p. 5.

\*\* Vol. II, p. 1154, fol. 1377.

were never subscribed to by the inventor, nor supported by his oath as prescribed by the statutes.\*

(3) The patent is also invalid because it is completely anticipated by and devoid of patentable novelty over the prior art.

### **Argument.**

Before taking up specific consideration of the points of argument outlined above, it is necessary to have an understanding of the subject matter of the litigation, as well as of the patent.

#### **Subject Matter of the Case.**

We are here concerned with radio antenna structures, and, more particularly, with that type of antenna structure which is used for short-wave, directional radio telegraph communication, as distinguished from radio broadcast.

The most familiar example of radio broadcast are the news, music and entertainment broadcasts throughout the nation. The antenna employed for that type of radio communication radiates the radio waves in *all* directions so that they may be received at any and all points of the nation (and, indeed, by foreign countries).

As distinguished from this, radio *telegraph* communication, with which this case is concerned, employs a directive antenna which radiates radio waves as a *beam* directed at a particular receiving station.

Undisputedly, it has been the practice in the radio art for many years prior to the earliest date with which this

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\* Sections 4888 and 4892 R. S. These sections of the statute will be found in the appendix hereto, *post*, p. 53.

case is concerned, to use *directive* antennas in radio telegraph communication; and for many years the simple expedient that has been employed for this purpose (and is employed in the Carter patent in suit) is to locate a *second* antenna, similar to the *radiating* antenna, and in back of it, where it serves as a "reflector", similar, in effect, to a mirror located back of a light, to concentrate the light radiations into a beam.

The patent in suit, as well as petitioner's antennas, radiate what are termed "*short*" waves, as distinguished from what the art knows as "*long*" waves. All radio waves radiated from an antenna structure have some definite length. A radio wave has been frequently pictured as similar to sea waves, and the length of a radio wave is the distance, usually measured in meters, between the crests of two succeeding waves.

The phenomenon of radio waves was first discovered by an experimenting investigator employing extremely *short* wave-lengths of the order of a few centimeters. The practical application of radio waves for communication and other purposes, however, began with much longer wave-lengths, and the trend in the art was to increase the wave-lengths in proportion to the desired distance of communication. Considerably more than a decade ago, however, the art began to swing back to the use of shorter wave-lengths, with the result that for radio telegraph communication, especially in the public utility field, it is now virtually the universal practice to radiate radio waves of short wave-lengths.

There is no sharp line of division between long wave-lengths and short wave-lengths. As a matter of practical usage, however, the art, from time to time, has arbitrarily selected a dividing line, calling all wave-lengths above a

certain length "long", and all those below that length "short". We are not here concerned, however, with any nicety of definition.

The Carter patent, not being a pioneer in any sense, and being expressly directed to a most specific detail of antenna construction, it is unnecessary to indulge in a scientific exposition of the principles underlying radio communication. For the purpose of this case a brief, non-technical explanation will be sufficient.

#### **The Operation of a Radio System.**

Radio communication requires a sending station and a receiving station. At the sending station there is provided a source of current which is fed to the transmitting antenna, and from it propagated or "radiated" as a wireless wave to the receiving station. At some point in the transmitting station the current is *altered* in some respect ("modulated" or "intermodulated", as it is technically termed), by or in accordance with the signal to be transmitted. Thus, it is the "altered" wave that is radiated from the antenna. This wave impinges on the antenna at the receiving station, and affects an electric current at the receiving station. The character of effect on the receiving-station current is determined by the character of the "altered" radiated wave. This effect is "read" as the message thus transmitted and received.

#### **The Antenna.**

As above stated, the present litigation has to do solely with antenna *structure*. The effective part of an antenna structure is an ordinary copper wire from which the radio waves are radiated. These antenna wires have always been supported by "towers", "poles", or other supporting

structures, at the desired height above the ground, and in the desired parallel, vertical or angular relation to the ground, depending upon matters of design, desired functioning, etc. The height of the wire above the ground depends on the wave-length used. The art prior to the Carter patent employed antenna wires arranged vertically, horizontally, or at an angle to the earth's surface. The art likewise employed antenna structures in which more than one wire was used. Likewise, the prior art had employed antenna wires arranged angularly with respect to each other to form a "V" or an "X". Finally, the prior art used a "reflector" for rendering the antenna "directive" so as to concentrate the radiated waves into a *beam* directed towards the desired receiving station.

In short, the art prior to the Carter patent in suit disclosed a multitude of types and arrangements of antenna wires, singly or in multiples, alone or with reflector, vertically, horizontally or angularly arranged towards the earth or towards each other. This is not disputed.

Let us next turn, therefore, to the Carter patent to ascertain what it purports to add to this acknowledged prior art.

#### **The Carter Patent.**

In the first place, the patent is directed and expressly limited to but one of the old specific antenna structures, viz: one in which two radiating wires are employed, and are angularly arranged with respect to each other to form a "V". No novelty is claimed by the patent for a "V" antenna. As before stated, such an arrangement of antenna wires was concededly old in the art. It is shown and described, for example, in Fig. 2 of the prior Lindenblad Patent No. 1,927,522 (Vol. II, p. 486), which was one of

the patents originally in suit, and as to which the District Judge dismissed the bill of complaint, which dismissal was affirmed by the Court of Appeals.<sup>9</sup>

In the next place, the patent is expressly directed and limited to that type of V antenna structure in which principal radiation is effected *only in the plane of the wires* and on the axis or bisector of the V. Thus, if the wires are arranged *horizontally*, then *radiation* is horizontal; if the wires are arranged *at an angle* to the earth's surface, then radiation is *at the same angle*, but always *in the plane of the wires*.

This is made perfectly clear by the patent. Petitioner's expert Kelley pointed out (Vol. I, p. 220, Q389 to p. 223, fol. 318) eleven instances in the patent where, by one form of expression or another, that is what is advanced and described as the precise thing to which the patent is directed and confined.<sup>10</sup> On this the experts of both sides (Kelley for petitioner and Hogan for respondent) were in entire accord (Vol. I, pp. 223, 224, Qs. 395-397).<sup>11</sup> Hogan additionally testified (XQ735, Vol. I, p. 187):

"The Carter third patent tells how to build a V antenna, which not merely concentrates the energy along the direction of the axis of the system, but *within the plane of the wires in a beam along the line of the bisector.*"\*

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<sup>9</sup> There are numerous other instances of "V" type antennas in the prior art to which reference may likewise be made. For example, see Betherod French Patent No. 596,737 of 1925 (Vol. II, p. 824), and Levy French patent of addition No. 30,798 of 1926 (Vol. II, pp. 872-873).

<sup>10</sup> See the patent, Vol. II, p. 499, lines 62, 64, 74; p. 500, lines 29, 42, 97; p. 501, lines 71, 86, 110, 124; p. 502, lines 3, 27.

<sup>11</sup> See also Vol. I, p. 121, fol. 177; p. 122, fol. 178; p. 125, fol. 182.

\* Italics ours in this brief, unless otherwise stated.

Indeed, the patent states (Vol. II, p. 502, lines 27 *et seq.*) that when it is desired to radiate *at an angle* to the earth's surface it is necessary to tilt the wires from their *normal horizontal position*, to the *required angle to the earth* so that the wires are aimed like a gun, thereby, *at all times*, preserving the essential feature of the patent that the radiated waves be retained in and limited to the plane of the wires and along the axis or bisector of the angle between them.<sup>12</sup>

This express provision of the Carter specifications was not an oversight, or the patent draftsman's error. To the contrary, it was intentional and deliberate. This is conclusively shown by a subsequent patent to Carter (No. 2,027,020, Vol. II, p. 755) which was filed after the construction of petitioner's antennas and issued on January 7, 1936, during the trial of the case. It is in evidence as Defendant's Exhibit U.

In this later patent Carter says with respect to the patent in suit:

"In my United States patent No. 1,974,387, granted September 18, 1934, there is described a V type antenna arrangement which is adapted to radiate energy directively. This arrangement comprises a pair of linear conductors which are long relative to the length of the communication wave and disposed at an angle in such a manner that when energized radiation occurs *principally along the bisector of the angle*" (p. 755, ll. 3 *et seq.*).

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<sup>12</sup> The language of the patent is (Vol. II, p. 502, line 27):

"The wires, though preferably placed in horizontal planes may be placed at any desired angle without departing from the scope of this invention, and, during transmission *it may often be found desirable to have the plane of the wires tilted away from the earth and towards the direction in which the beam of energy is to be propagated.*"

*"So far, the effects of ground upon the resulting radiation have not been mentioned. In both theory and practice it has been found that the reflections from ground are such as to always result in zero radiation horizontally at the usual communication distances from any short wave antenna. It has also been found that radiation at angles in the neighborhood of 10° to the horizon is most effective at a distance receiver"* (p. 756, ll. 29 et seq.).

Thus, the *later* Carter patent constitutes an irrefutable admission by Carter that his patent here in suit, deals *only* with radiations from an antenna *in the plane of the wires*, and the specification of the patent in suit is consistent, from beginning to end, with this admission.

On this the Trial Judge found (Vol. II, p. 1145, fol. 1362) :

*"The main object of the three antenna patents in suit was to arrange two or more antenna wires so that radiation takes place in the plane of the wires horizontally if the wires are horizontal with respect to the ground and at angle if the wires are tilted at an angle."*

Again, the Trial Judge found (Vol. II, p. 1155, fol. 1378) :

*"The third Carter patent in suit deals only with horizontal radiation from an antenna in the plane of the wires and the bisector of the angle."*

In the face of the foregoing facts, and in the teeth of the testimony of experts on both sides, the Court of Appeals below reversed the Trial Court, saying (Vol. II, p. 1172, fol. 1407) :

*"Long distance short wave transmission is not carried on by means of signals transmitted horizontally along the surface of the earth; the signals that reach a distant receiving antenna are those which have left*

the transmitting antenna *at a small upward angle* and been deflected back to earth by a portion of the upper atmosphere that reflects radio waves due to the fact that it is conducted because of ionization."

Rather than affording a basis for a reversal of the District Court, this statement of the Court of Appeals emphasizes the soundness of the District Court's conclusion that the patent, which was *expressly* directed and confined to operations "*not carried on*" in long distance short-wave transmission, was purely a paper patent, of no practical value, *and not followed in practice by either respondent or petitioner.*<sup>18</sup>

Thereupon, the Court of Appeals, in a statement diametrically opposite to the finding of the Trial Judge, and completely belied by the patent on its face, as well as by the expert testimony of *both* parties, proceeded to say (Vol. II, p. 1172, fol. 1408):

"The main consideration is that Carter described a practical directive antenna which is of great commercial utility *when used just as he said it was to be used.*"

Of course, no *novelty* is claimed for Carter in confining the radiated waves to the plane of the wires, even in a V type antenna, because, as appears on their faces, and as found by the Trial Judge, that feature was fully disclosed in the prior antenna patents (the Lindenblad patents originally in suit). Indeed, the Trial Judge, after stating that the main object of all three of the antenna patents was to effect radiation only "in the plane of the wires" (see *ante*, p. 14) found (Vol. II, p. 1145, fol. 1362):

"The wires are arranged parallel to one another in the first Lindenblad patent in suit and according

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<sup>18</sup> See District Court's decision, Footnote 5, *ante*, p. 6.

to it the principal radiation is concentrated in the plane of the wires as distinguished from prior arrangements in which, according to Lindenblad, radiation took place in other directions outside of the plane.

The purpose of the second Lindenblad patent in suit was to improve on the first Lindenblad patent in suit by concentrating radiation not only in the plane of the wires, but along the axis of the V into which the two wires are formed, which constitutes the bisector of the angle formed by the wires.

The third Carter patent in suit has as its object to improve on the second Lindenblad patent in suit by achieving an even greater concentration in the plane of the wires along the bisector of the angle by selection of the proper angle between the legs of the V."

Thus it will be seen that all that is advanced as Carter's contribution is, as stated by the Trial Judge, the "selection of the proper angle between the legs of the V" at which maximum concentration of radiation in the plane of the wires and along the bisector can be effected.

#### **The Angle of the "V".**

An examination of the specifications of the patent (Vol. II, p. 499 *et seq.*) reveals that the formula by which the angle of the V is determined is expressed in mathematical equations of trigonometrical function. And, as so stated, either precisely, or in empirical form, expressly forms the subject matter of most of the forty-one claims of the patent, and impliedly of all of them. Claims 1, 2, 3, 4, 10, 12, 15, 16, 28, 34, 35, 36, 38 and 40 of the patent (fourteen in all) were put in issue at the trial. Respondent acquiesced in the District Court's finding of non-infringement of all of them except claims 15 and 16, to which two claims its appeal was

confined. These two claims express this mathematical formula in "empirical" form.<sup>14</sup>

In the District Court respondent claimed (through its expert witness) that this mathematical formula was novel with Carter, and, presumably, constituted his invention.<sup>15</sup>

However, respondent conclusively proved that the formula had been devised and published by a well known scientist Abraham more than thirty years before Carter.<sup>16</sup>

In consequence, respondent abandoned its contention made in the District Court, and conceded in the Court of Appeals that there was no element of novelty or invention in the utilization of the Abraham formula, and advanced the *empirical* statement of the Abraham formula as Carter's invention.<sup>17</sup>

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<sup>14</sup> Claim 15 in suit reads as follows:

"An antenna comprising a pair of relatively long conductors disposed with respect to each other at an angle substantially equal to twice

$$50.9 \left( \frac{l}{\lambda} \right) - 0.513$$

degrees,  $l$  being the length of the wire and  $\lambda$  the operating wave length in like units, and means in circuit with said antenna for exciting the conductors in phase opposition whereby standing waves of opposite instantaneous polarity are formed on the conductors throughout their length."

Claim 16 merely adds to claim 15 the old "reflector".

<sup>15</sup> Hogan, Vol. I, p. 122, fol. 179.

<sup>16</sup> See Abraham articles, Vol. II, pp. 761-784.

The Trial Judge found (Vol. II, p. 1151, fol. 1372) :

"The mathematical formula advanced as the invention of the patent was copied from the prior art formula of Abraham which had been used by engineers for determining the identical angle for which it was employed by Carter."

Again the Court stated (p. 1152, fol. 1373) :

"The Abraham formula for determining the angle between the legs of the V is copied in the specification."

<sup>17</sup> Further discussion of the Abraham formula will be had later, when considering the prior art (*post*, pp. 43, 49).

### Wire Length.

There is but one further point to be considered in connection with the disclosure of the Carter patent. The Abraham formula is *correctly applicable only* to antenna wires an integral number of half wave-lengths long. In other words, if an antenna radiates waves of 50 meters, the Abraham formula would be correctly applicable to determine the proper angle of the "V" *only* if the wires are of a length consisting of *an integral number of half wave-lengths*, viz: 50 meters, 75 meters, 100 meters, 125 meters, etc.

From this it will be seen that neither the angle of the V nor the wire length, alone, will determine the direction of principal radiation. It is a *combination* of them which determines it, and it can be determined by the Abraham formula *only* for an antenna wire of a length consisting of *an integral number of half wave lengths*. The Carter patent itself points out (Vol. II, p. 500, lines 61-62) that in the formula

*"The letter 'n' indicates the number of half wave lengths contained in the wire"*

regardless of whether or not one is dealing with an *odd* number of half wave lengths or *even* numbers thereof. The patent further states (p. 501, lines 16, *et seq.*):

*"The law giving the correct angle for lengths between odd and even number of half wave lengths is not given herein due to its complexity \* \* \*."*

In other words, the patent on its face purports to apply the Abraham formula to the *odd* and *even* multiples of half wave lengths *and to nothing in between them*.

Thus, the Carter application, *as originally filed*, was expressly limited in its specifications and claims to antenna wires *an integral number of half wave-lengths long* to which

the Abraham formula (and the empirical formula based thereon) would *correctly* apply. Petitioner, on the other hand, does not use antenna wires an integral number of half wave-lengths long (with the exception of antenna No. 8, which, however, does not use the *angle* prescribed by the formula). In consequence, none of petitioner's antennas employs the angle called for by the Abraham formula, either as originated by Abraham and copied by Carter, or as stated in empirical form by Carter.

Because of this fact (of which respondent was made cognizant by petitioner's answer to the original bill of complaint) the specifications of the then still pending Carter application, as well as the claims, were amended, *after the formal allowance of the application by the Patent Office on June 13, 1934*<sup>18</sup> so as to define the term "plurality of half wave lengths" as meaning *an* antenna of *any* length—a wholly meaningless thing and entirely inconsistent with the plain language originally employed.

Thus, the Carter specification was amended by adding thereto the paragraph now appearing on page 502, lines 35-42 of the patent, which states, in effect, that by the term "a plurality of wave lengths" or "a plurality of half wave lengths" or "several half wave lengths" not only an *exact* integral number of such lengths, *but also all other lengths*, were meant.<sup>19</sup> A similar amendment was made to substan-

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<sup>18</sup> Vol. II, p. 1109.

<sup>19</sup> The exact language of the amendatory insertion into the patent specification is (Vol. II, p. 502, lines 35 *et seq.*; amendment, p. 1123):

"By the term 'plurality of wave lengths', or 'plurality of half wave lengths', or 'several half wave lengths', it is not intended that the wires so described shall necessarily be an *exact* or *approximate* integral number of such lengths, unless so specified, but rather that each of the wires so described shall be sufficiently long *to include* the lengths specified."

tially all of the claims. Original claim 5, for instance (Vol. II, p. 1043) defined the length of the conductors as "substantially a plurality of half wave lengths long." This was changed in the amendment (Vol. II, p. 1123) to read:

"of a length *including* substantially a plurality of half wave lengths."

There was nothing in the original specifications that warranted such expansion of Carter's disclosure. To the contrary, prior to the revolutionary amendment of the Carter specifications and claims, several of the claims (specifically including claim 15 here in suit, originally numbered as 19) were rejected on the second Lindenblad Patent (No. 1,927,522, Vol. II, p. 486, *et seq.*). In the endeavor to establish a difference between Carter and Lindenblad, Carter stated (Vol. II, p. 1085):

"It is admitted that the Lindenblad patent is broad and dominates the present arrangement in some respects, but it is submitted the patent *does not show* the relation between the angle and the exact length of antenna as applicant teaches." (Emphasis Carter's.)

Then, again (p. 1104):

"It is herein repeated that these claims define a *precise relation between the angle and the length of the antenna, which is not to be found in the Lindenblad patent.*"

And, again (p. 1105),

"Lindenblad necessarily has included in his general conception the thought of a V type antenna, *but he did not include the definite precise relation between the angle and the length of the antenna for giving the best results.*"

As to this the Trial Judge found (Vol. II, p. 1145, fol. 1363) that the Carter patent distinguished from Lindenblad only by

“selection of the *proper* angle between the legs of the V”.

The Trial Court further found (Vol. II, p. 1146, fol. 1364) that

“Carter’s formula is predicated upon the *precise* relation between the angle of propagation and the *exact* length of the antenna wires, which *must* be an integral number of half wave lengths in order to be accurate.”

Therefore, not only was the Carter patent deliberately and intentionally confined, as originally filed, to the *precise* angle and *exact* wire length, but it was known to Carter, and admitted in his file wrapper, that it was *only* by that *precise* relation that he differed from the prior Lindenblad patent.

Thus, Carter’s claims were allowed as a result of these express representations to the Patent Office. *After the formal allowance of his application*, however, and as a result of oral interviews had with the Examiner, to which reference is made in the file history (Vol. II, pp. 1124, 1125), the claims, procured by his plea and admission that his *invention* was for this limited, *precise* thing, were changed and are *now* advanced as *not* limited to the *precise* angle, but covering a *wide range* of angles; and *not* limited to antenna wires having an *exact* length consisting of an integral number of half wave lengths, but to *all* wires *regardless of their lengths*.

### The Opinion of the Court of Appeals on this Point.

The Court of Appeals quite erroneously stated, referring to wires several half-wave lengths long:

"Carter found that interpolation between these lengths was sufficiently accurate for practical purposes and disclosed the angles to use for V antennas using wires of *intermediate lengths*." (Vol. II, p. 1173, fol. 1408.)

Not only does the Carter patent contain no disclosure of such angles, but it is admitted in his patent (Vol. II, p. 501, line 16 *et seq.*) :

"The law giving the correct angle for *lengths between* an odd and even number of half wave lengths is *not* given herein *due to its complexity*."

This is followed by the statement in the patent that for all practical intents and purposes the *empirical formula* will be found accurate enough. Petitioner answered this by evidence which conclusively proved that for intermediate lengths *neither the Abraham nor the empirical formula*, but a wholly different formula is applicable. The difference was graphically illustrated in Defendant's Exhibit X, Vol. II, page 821. Moreover, this subject was thoroughly covered by the experts of both sides, and the Trial Judge, after weighing all of the evidence bearing on the subject, found (Vol. II, p. 1555, fol. 1377) :

"The two Abraham formulae are applicable *only* to wires an *exact* number of wave lengths long. It is true that in Fig. 12 of the patent Carter drew a smooth curve which apparently includes all lengths of wire between the half wave lengths *but I am convinced that neither Carter's empirical formula nor Fig. 12 make a correct showing of what happens when the wires are other than exact multiples of half wave lengths.*"

**Summary.**

Thus, the Carter patent is directed—

- (1) *to a V antenna structure* (concededly old in the art),
- (2) *in which radiations are confined to the plane of the wires and on the axis or line bisecting the V* (concededly old in the art, and of no utility, being employed by no one, not even by respondent);
- (3) *the exact or precise angle of the V at which the maximum of such radiation would be effected being determined by a mathematical formula* (literally copied by the patentee from the Abraham publication);
- (4) *empirically stated* (as within the province and capability of any engineer).

The patent thus obtained not only differed radically in material and essential respects from the application for patent as originally filed, but was inconsistent and contrary thereto, as well.

This, then, is the patent by which respondent endeavors to blanket the public service world-wide radio telegraph field, and eliminate competition therein.

**POINT I.**

**The Carter patent is not infringed.**

Petitioner employs the old V-type antenna structures. Eleven of its antennas are charged to infringe. There are a number of features incident to them which take them completely out of the Carter patent. These are:

1. None of petitioner's antennas is designed to or in fact radiates *in the plane of the wires*. On the contrary,

petitioner's antennas *intentionally* radiate at a substantial angle to the plane of the wires, for the deliberate purpose of utilizing the reflective effect of the Heaviside layer. (Pratt, Vol. I, p. 203, fol. 289; Kelley, Vol. I, Qs. 292-295, pp. 208-209; XQ1089, p. 273).<sup>20</sup>

Thus, Mr. Pratt, petitioner's Chief Engineer, who designed and supervised the erection of all of petitioner's antennas, stated (Vol. I, p. 203, fol. 289):

*“Referring to the antennas Nos. 1 to 11 at Sayville, I do not know of any case where radiation is propagated predominantly in the plane of the wire.”*

Likewise, petitioner's expert Kelley testified (Vol. I, p. 208):

*“Q292. Referring to defendant's antenna, in the case of any antenna employed by defendant, is the propagation of the radiant energy predominantly in the plane of the wires? A. No, sir, the radiation is sent out at a considerable angle, a substantial angle, to the plane of the wires.”*

*“Q293. Is that accomplished accidentally or as a matter of design? A. That is accomplished as a matter of design.”*

*“Q295. What is the purpose of propagating the radiant energy from defendant's antennas at an angle to the plane of the wires? A. The purpose is to make use of what is known as a sky wave so that, as is well known in short wave radio systems, the energy can be reflected from the upper ionized layers of the atmosphere, and consequently sent to great distances.”*

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<sup>20</sup> The Heaviside layer is a region of ionized atmosphere of from 100 to 200 miles from the earth's surface.

2. None of petitioner's antennas propagates its main lobe of radiation *on the axis or bisector of the angle of the V.*

3. None of petitioner's antennas (with the exception of antenna No. 8) uses wires *an integral number of half wave-lengths long*, as was originally specified by the Carter patent. On the contrary, petitioner's radiator wires depart from the half wave-length measure as far as it is possible to do so.<sup>21</sup>

4. None of petitioner's antennas utilizes an angle between the legs of the V that is dependent upon the Abraham formula, either as originally stated by Abraham or as restated by Carter in empirical form. This especially applies to petitioner's antenna No. 8 above referred to. The application of the foregoing statement to the remainder of petitioner's antennas will be made evident by the consideration that the formula is predicated upon the *precise* relation between the angle of propagation and the *exact* length of the antenna wires, which *must* be an integral number of half wave-lengths in order to be correct, and which petitioner does not employ.

Because of the foregoing *facts* with respect to petitioner's antennas, which were conclusively established by the evidence—including testimony of experts and engineers as well as by documentary proofs—and which, in the main,

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<sup>21</sup> See Plaintiff's Exhibit 13, Vol. II, p. 530, the stipulated specifications of petitioner's antennas. It will be noted in the marginal heading "Length of one V Wire" the wire length is given expressed in wave lengths. In each instance, with the exception of antenna No. 8, the wire lengths are almost exactly a quarter wave length longer or shorter than a multiple of an even or an odd number of half wave lengths. In other words, petitioner's antennas depart from a multiple of half wave lengths *as far as is physically or mathematically possible.*

was not disputed by respondent, the Trial Judge made the findings reproduced in part in footnote 4, *ante*, page 5.

It is unthinkable that a "paper" patent, unused by anyone, could be adjudged to be infringed by any of petitioner's highly efficient commercial antennas.

**Opinion of the Court of Appeals on this Point.**

Contrary to all of the foregoing, the Court of Appeals described the antenna of the Carter patent as follows:

"This antenna consists of one or more pair of long, straight, unmodified wires, placed at a *preferred angle*" (Vol. II, p. 1168, fol. 1402).

From what has been said above, the error of the Court will be manifest. The patent does not even pretend to be for a V antenna having a *preferred angle*. It is for so *precise* an angle that it can be defined only by a mathematical formula. Indeed, the statement of the Court of Appeals is expressly belied by Carter himself (as hereinbefore pointed out, *ante*, p. 20) in inducing the Patent Office to grant a patent to him over Lindenblad.

Having thus construed the Carter patent the Court proceeded to find infringement in the face of the fact that *it was conceded that petitioner's antennas did not employ the precise or exact angle obtained by the Abraham formula*. The Court did this with the assertion that petitioner's antennas used "substantially" the angles determined by the formula, even including within its holding antenna No. 8 which departed therefrom as much as ten per cent. Indeed, in one instance (Vol. II, p. 1171, fol. 1405), the Court held that petitioner had utilized "*substantially the exact*" angle specified by Carter, whatever that expression might mean.

Notwithstanding the fact that the patent was expressly obtained for a *precise* angle, the Court of Appeals has given it an interpretation by which it covers a wide and apparently unlimited *range* of angles. Such an interpretation of the patent inevitably necessitates its invalidation by the Lindenblad V-antenna patent alone, which, because it fails to specify *any* angle, inescapably discloses a *range* of angles.

In addition to the foregoing, the Court of Appeals held (Vol. II, p. 1172, fol. 1408):

*"Most of appellee's antennas do not use wires that are of integral number of half wave lengths but that does not avoid infringement."*

It is believed that this holding, on which its conclusion was in part, if not wholly based, is so palpably erroneous in view of what we have hereinbefore pointed out as to require no further comment.

## POINT II.

**The Court of Appeals below reversed every essential finding of fact made by the Trial Judge on the conflicting evidence before him, without reference to the evidence or even mention thereof.**

This Court, in *Adamson v. Gilliland*, 242 U. S. 350, at page 353, stated the "rule", particularly applicable to patent cases, to be:

*" \* \* \* so far as the Master or Judge who saw the witnesses 'depends upon conflicting testimony or upon the credibility of the witnesses, or so far as there is any testimony consistent with the finding, it must be treated as unassailable'."*

We can conceive of no case to which this rule should be more applicable than to the present one. The subject matter of the suit is extremely technical, involving abstruse theories of scientific principles expressed in mathematical formulae, derived from differential and integral calculus equations, and expressed in terms of trigonometric function. The trial involved five patents directed to various highly scientific phases of the subject matter, and lasted nearly a month, during which time more than a score of witnesses were examined and cross examined. They included experts for both sides, whose knowledge, experience, and other qualifications were unquestioned by either side, and was demonstrated by the thoroughness and care with which they discussed the subject matter of the suit.

As a result, and based on his study of the prior art explained to him, also on his seeing and hearing the witnesses testify, as well as on the careful scientific preparation, definition and exposition of the technical issues presented for decision, the Trial Judge made findings of fact expressed in his opinion, and accepted by both sides, by stipulation, as such.

These findings include:

(1) That the Carter patent in suit:

"is expressly limited as to some claims, and impliedly as to all thereof, to *radiation in the plane of the wires* and, in fact, on the line bisecting the angle between the legs of the V" (Vol. II, p. 1153, fol. 1375).

And, again, that:

"The third Carter patent in suit deals *only* with horizontal radiation from an antenna *in the plane of the wires* and the bisector of the angle" (Vol. II, p. 1155, fol. 1378).

(2) That—

“The defendant's antennas which are charged with infringement *differ radically* from the inventions claimed in the three antenna patents in suit” (Vol. II, p. 1145, fol. 1363).

And that

“ \* \* \* all of the defendant's antennas are intentionally designed to cooperate with ground effect, which effect not only is not contemplated by any of the patents in suit but is *contradictory* to the description and claims thereof” (Vol. II, p. 1146, fol. 1364).

The Court also found:

“Due to the *departure* from the Carter patent in the respects enumerated and by reason thereof in all of defendant's antennas here charged to infringe, defendant obtains material advantages and increased efficiency in that material increase in radiated power is obtained” (Vol. II, p. 1151, fol. 1372).

Again,

“Defendant does *not* radiate in the plane of the wires \* \* \* ” (Vol. II, p. 1153, fol. 1375);

and

“As I have hereinbefore stated, defendant's V antennas radiate at an angle to their planes and to their bisectors, and this is *contrary* to Carter's teachings” (Vol. II, p. 1155, fol. 1378).

Also—

“ \* \* \* the fact is, however, that defendant's systems are *radically different* from the patents in suit, in structure, principle of operation and instrumentalities, and were designed and constructed to secure

and did secure greater radiation, *by reason of such difference*, than could be obtained by the patents in suit" (Vol. II, p. 1157, fol. 1380).

(3) That the Carter patent is confined to the *precise* angle of the V antenna, and only in that respect did it purport to differ from the prior Lindenblad V antenna patent which, concededly, was of the prior art. The Trial Judge found:

"The Lindenblad patent does not show the relation between the angle and *exact* length of the antenna as Carter teaches, and in the claims as amended he defines the *precise* relation between the angle and the length of the antenna. The defendant does not use the *precise* relation of the Carter patent, and, in view of the Lindenblad patent, Carter could not obtain claims to cover a *range* of angles. All of defendant's antennas differ from the angle specified by Carter, and while the difference is not great, it is as great as the difference between Bruce (of the prior art) and Carter. If defendant's antenna No. 8, where the angle is differed 10% from Carter, infringes, then Lindenblad anticipates" (Vol. II, p. 1156, fol. 1379).

(4) That the statement and claim of invention of the Carter application as originally filed was altered and broadened by amendment in the endeavor to claim as the invention something which was not only *not* originally disclosed, but which was inconsistent with and contrary to what *was* originally disclosed. The Trial Judge found:

"The disclosure and the claims were broadened not only contrary to their original terminology but to their spirit as well" (Vol. II, p. 1154, fol. 1377).

In making this finding it was necessary for the Trial Court to consider the technical and practical definition

of terms and phraseology employed in the Carter application as filed, and in the Carter patent as issued, as well as the proper and intended meaning of those terms addressed to the man skilled in the art. For example, it was necessary for the Court to weigh, in the light of the conflicting evidence directed thereto, respondent's contention that the Abraham formula, empirically stated, could be correctly applied to wires of a length other than exact multiples of half wave-lengths. As a result the Trial Judge found:

“ \* \* \* but I am convinced that neither Carter's empirical formula nor Fig. 12 make a correct showing of what happens when the wires are other than exact multiples of half wave-lengths" (Vol. II, p. 1155, fol. 1377).”<sup>22</sup>

As another example, it was necessary for the Trial Judge to determine whether or not the statement contained on the face of the Carter patent (Vol. II, p. 499 lines 29-34) to the effect that the invention was applicable to wires of "any finite length", which statement was added to the specification by amendment after the commencement of the present suit, meant the same thing as a statement employing the word "finite" made in the application as originally filed (Vol. II, p. 1032), and which was thereafter canceled on May 2, 1934 (Vol. II, pp. 1092, 1093).

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<sup>22</sup> "Fig. 12" here referred to is Fig. 12 of the drawings of the Carter patent which purports to be merely a curve drawn through points plotted on graph paper so as to connect more or less smoothly the points determined by the Abraham formula. This is made quite clear from the patent specification (Vol. II, p. 500, lines 78 *et seq.*) where it is stated:

"Obviously the critical value of  $\theta$  for either of the above equations may readily be determined; its value for wires up to fourteen wave lengths long is given graphically in Figure 12."

As a result of the extensive exposition of these questions by both sides, and after weighing the conflicting testimony on the issue, the Trial Judge stated:

“I do not agree with plaintiff’s contention that the original specification warranted such extension of Carter’s disclosure” (Vol. II, p. 1154, fol. 1376).<sup>23</sup>

Again, the Trial Judge said, this time with *express* reference to the use of the term “finite length” in the passage above referred to, appearing on the first page of the patent as issued:

“Even this passage was added in the amendment of May 2, 1934, and after the commencement of this action” (Vol. II, p. 1155, fol. 1377).

(5) Finally, that the patent in suit was directed (as were, likewise, the other two antenna patents originally in suit) to a theory not followed in practical communications, and that the alleged invention thereof had never been employed by anyone, not even by respondent. The Court found:

“In substance all of the antenna patents in suit present merely a theoretical application of antenna wires in free space, whereas all of the defendant’s are intentionally designed to cooperate with ground effect, which effect not only is not contemplated by any of the patents in suit, but is contradictory to the description and claims thereof.” (Vol. II, p. 1146, fol. 1364.)

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<sup>23</sup> It should be noted that in passing on the issues of validity and infringement of the *other* patents in the case it was necessary for the Court to thoroughly understand this language. See, for example, the opinion of the Trial Judge on the *other* patents (Vol. II, p. 1135, fol. 1348).

Also, the Trial Judge found:

"None of the patents in suit are pioneer patents, as contended by plaintiff, and the record does not show that they have been employed by any one; even the plaintiff's own commercial structures do not follow the teachings or employ the instrumentalities shown, described or claimed in any of the patents in suit, as I have interpreted the same." (Vol. II, p. 1156, fol. 1380.)

*The Court of Appeals reversed each and every one of these findings of fact without reference to or even mention of the evidence on which the Trial Judge's findings were predicated, and without pointing to any error on the part of the Trial Judge on which to base a contrary finding.*

It cannot be questioned but that each and every finding of the Trial Judge is based on competent testimony with which the finding is "consistent". As to some of the points, the testimony stands either unchallenged or expressly accepted; as to others, conflicting testimony by the experts of both sides raised issues of fact which the Trial Judge resolved, both upon the "conflicting testimony" and upon the "credibility of the witnesses". The findings of the Trial Judge, therefore, should have been treated as "unassailable", and the Court of Appeals committed error in failing to do so.

### POINT III.

**The patent is invalid because of the unlawful amendment thereof, made in the endeavor to mold the patent as to disclosure and claims so as to cover petitioner's antenna systems, and which amendment was contrary to the original statement and claim of invention.**

This suit is an outstanding example of that class of cases, so frequently met with, where an inventor (or more often his assignee) by means of a pending patent application seeks to keep abreast of the art and dominate that art by means of amendment, modification, and re-statement of invention and claim wholly inconsistent with the usually worthless application originally filed. The result is that a patent issues, not for the invention for which the inventor made application, but for something wholly foreign to and, as in this instance, wholly inconsistent with the alleged invention originally presented.

This Court said many years ago, in *Chicago & N. W. Railway Co. v. Sayles*, 97 U. S. 554, 563, in invalidating the patent then before it on this ground:

“The law does not permit such enlargements of an original specification, which would interfere with other inventors who have entered the field in the meantime, any more than it does in the case of re-issues of patents previously granted. Courts should regard with jealousy and disfavor any attempts to enlarge the scope of an application once filed, or a patent once granted, the effect of which would be to enable the patentee to appropriate other inventions made prior to such alteration, or to appropriate that which has, in the meantime, gone into public use.”

See, also, this Court's recent decision (rendered Nov. 7, 1938) in *The Schriber-Schroth Co. v. The Cleveland Trust Co., et al.*

In a case involving this same question, the Court of Appeals for the Third Circuit in *Lopulco Systems Inc. v. Bonnot Co.*, 24 Fed. (2) 510 (cited with approval by this Court in *Powers-Kennedy Contracting Corp. v. Concrete M. & C. Co.*, 282 U. S. 175, 186) said:

"The duty of careful scrutiny in such cases was referred to by this court in *Hestonville v. McDuffee* (C. C. A.) 185 F. 802, where it was said: 'when, therefore, a patentee, seven years after his original application'—in the instant case two years—'and enlightened by such intervening years of progress, seeks not to prosecute his original application, but to amend the same, and on the basis of such amendment to make claims of a different character from those originally made, it becomes the duty of a court to zealously and jealously scrutinize such belated application'."

See also *Irving Air Chute Co. v. Zwitlik Parachute & Equipment Co.*, 82 Fed. (2) 644 (C. C. A. 3rd).

It follows, therefore, that the Carter patent is invalid on this ground.

We are not unmindful of the fact that claims 15 and 16, to which the case is now confined, were, in substantially the same form, in the application as originally filed. It is elementary, however, that a patent claim must be construed in the light of the invention described in the specifications. Claims 15 and 16, as originally filed, could *not* have been construed as applying to antennas of any length other than an integral number of half wave-lengths. It is equally as elementary that if the patent is invalid because of unlawful amendment, no claim of the patent can survive. Obviously, it is just as fatal to unlawfully expand the statement of

invention so as to permit an otherwise innocuous claim to cover something without the compass of the invention, as it is to expand the claim itself so as to accomplish that result.

#### POINT IV.

**The patent is invalid because the amendment, which broadened its disclosure and claims contrary to their original terminology and spirit, was not subscribed to or supported by the oath of the inventor as prescribed by the patent statutes.**

Section 4888 of the Revised Statute <sup>24</sup> prescribes *as a condition to the grant of a patent*, that the inventor must subscribe to the application for patent and the claim he seeks. The pertinent words of the statute are:

“The specification and claim *shall* be signed by the inventor.”

This is mandatory, and a statutory prerequisite to a valid grant.

In addition, Section 4892 <sup>24</sup> requires, as a prerequisite to the patent grant, that the inventor make oath that he believes himself to be the original and first inventor of the invention “for which he solicits a patent”.

The Carter application, as originally filed, defined and claimed the invention as comprising the determination of the *precise* angle of the wires constituting the V antenna, and, quite correctly, that it was obtainable *only* with wires an integral number of half wave-lengths long. That original application was signed and sworn to by Carter, the applicant. The amendment to the claims which endeavored

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<sup>24</sup> See Appendix, p. 53.

to cover *all* antenna wires regardless of their length, in the effort to include petitioner's antennas within their scope <sup>25</sup>—viz: the amendment which directed the patent to a *different* and wholly *inconsistent* invention—was *never* subscribed or sworn to by the inventor.

The Court of Appeals, in *Westinghouse E. & Mfg. Co. v. Metropolitan E. Mfg. Co.*, 290 Fed. 661, 664, said, with respect to Section 4892 R. S.:

"That statute requires that one shall swear to his invention, and all of it; if he only swears to a part, and his attorney puts in the rest, it is exactly like any other yielding to the temptation of improving an affidavit after execution, by inserting additional allegations of fact. A claim is not a disclosure; but every claim must be justified by the disclosure. If, therefore, a new claim needs for its justification or validity an additional or new disclosure, such additional allegations of fact assuredly need a supplemental oath, not because they are to be used for an amended or new claim, but because they tell some fact of invention not told before."

We submit as obvious, therefore, that the Carter patent is invalid because it issued for an invention radically different from that for which application for patent was made, and the claim of invention, as amended, was neither subscribed to nor supported by the oath of the inventor—a statutory prerequisite to its valid grant.

#### **The Opinion of the Court of Appeals on this Point.**

Notwithstanding the fact findings on this point by the Trial Judge, the Court of Appeals, because Carter had used the word "finite" in his application as originally filed,

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<sup>25</sup> Amendment of August 4, 1934, Vol. II, p. 1122.

found that it was his intention to cover antenna wires of *any* length, as distinguished from the *exact* length consisting of an integral number of half wave lengths.

The only passage in Carter's application as originally filed in which the expression "finite" occurs is as follows (Vol. II, p. 1032):

"Still a further object of the present invention is to disclose the proper angle for conductors or radiators *either an even number of half wavelengths long or an odd number of half wavelengths long*, and, in general to disclose the angle for best directional propagation for wires of *any finite length*."

If this passage were construed to cover every possible length of wire, then the meticulous reference to conductors of an even number of half wave lengths and an odd number of half wave lengths would lose all meaning.

However, "finite" means the opposite of "infinite", and these terms have a very specific meaning in this art. As expounded by the experts and discussed by the Trial Judge in connection with the *other* patents that were before him, "standing waves" are produced if the wires have a "finite" length, and "traveling waves" if the wires are "infinitely" long.

The electrical characteristics of a wire may be so altered that it behaves the way a physically "infinitely" long wire would behave. Such electrically infinitely long wires would be used in a traveling wave antenna.

As distinguished from this, the Carter patent (see the first full paragraph on the same page of the application, Vol. II, p. 1032), had to do *only* with antennas in which "standing waves" are produced. Only thus could Carter differentiate from many prior antennas, including the one discussed

in the Lindenblad Patent No. 1,927,522, in which "traveling waves" are produced.

To produce standing waves the antenna wires must be of a "finite" length. It is clear, therefore, that in the quoted passage Carter merely meant to warn that the wires must not be physically or electrically extended to produce traveling waves.

Wholly aside from the technical meaning of the word "finite", could it be assumed that Carter in writing this passage had in mind all lengths? Obviously not, because then he would not have spoken in the same sentence of wires an even and an odd number of wave lengths long. If there were any doubt on this score it can be resolved by what happened later: When respondent discovered that none of petitioner's antennas satisfied the requirements of the then still pending Carter application, it erased this paragraph and, on May 4, 1934, substituted therefor (Vol. II, pp. 1092-3), the paragraph which will now be found in the Carter patent (Vol. II, p. 499, lines 29-34), and which reads as follows:

"Another object of the invention is to disclose the angle for the best directional propagation for open-ended wires of any finite length, preferably longer than the operating wave length, having standing waves thereon and arranged in the manner proposed."

There is no reference in this paragraph to wires an even or an odd number of wave lengths long, and this passage clearly covers the lengths of petitioner's antennas. The Trial Judge so held (Vol. II, p. 1155, fol. 1377), but gave it no weight, because the passage was interpolated by respondent *after the commencement of the present action*, and without there being any justification for it in the application as first filed.

## POINT V.

**The Carter patent is invalid because it is completely anticipated by and devoid of patentable novelty over the prior art.**

Before taking up a specific consideration of the prior art we desire more fully to explain the so-called reflector effect.

### **Reflector Effect.**

As previously pointed out (*ante*, p. 9) a reflector is a second antenna which cooperates with the antenna proper so as to cancel radiation in one direction, and reinforce it in the other, as well as to concentrate it into a beam.

The antenna and the reflector, referred to as the first and second antenna, must be properly spaced from one another.

There is no dispute that spacing of a reflector with respect to the radiator to obtain a unidirectional effect was old in the art.

Carter himself recognized the obviousness of the juxtaposition of a reflector with the V-antenna and characterized it as "well known" in the description that accompanied his letter to Mr. Tunick, his patent solicitor, dated May 9, 1930 (Vol. II, p. 666).

In spite of the fact that the First Carter patent and the First Lindenblad Patent (No. 1,884,006, Vol. II, p. 470, *et seq.*) show this even then old expedient, and in spite of the fact that in the I.R.E. article (Vol. II, pp. 589, 590) Carter, Hansell and Lindenblad describe the spacing of a reflector from a radiator as of the "usual" kind, we find that claim

16 of the Carter patent covers this identical spacing of a second antenna or reflector.

As we understand it, respondent's position is that while the reflector spacing is the same in the Carter patent as in the prior art, the *combination* of this old feature with the determination of the *precise* angle of the V amounts to invention, although the purpose, function, method of adjustment and installation are exactly and always the same.

Assuming, for the sake of argument, that the V-shaped arrangement of the radiator wires in the Carter patent were new, claim 16 could be sustained only by showing that the *combination* produced a *new and unexpected result* that one skilled in the art could not foresee.

Mills (Vol. II, pp. 878-880) published the rule of reflector effect in 1917 as of general application for *any* combination of antennas. Carter filed his first application (Vol. II, p. 463) in 1923 showing two types of antennas to which the Mills rule was applied. Lindenblad filed an application in 1928 (Vol. II, p. 477) in which he disclosed a different type of antenna, and there also the inflexible rule was applied just as stated by Mills. Carter then filed another application in 1930 (for the patent in suit), with still a different arrangement of antenna wires, and here again the rule applied.

Hogan described (Q76, Vol. I, p. 126) the spacing of the reflector in the Carter patent in suit in the same language which he used in connection with the First Carter Patent (No. 1,623,996). The effect of such arrangement was also well known. Hogan said (XQ304, Vol. I, p. 164):

"the cancellation in the rearward direction produced by the arrangement of two vertical antennas, for example, the quarter wave separation, and excited in quadrature, as you expressed it, did exist and was known prior to the application for this patent."

The reflector formula is employed by Carter in the same manner as it has always been employed, and in every instance, no matter what the shape or arrangement of the radiator may be, the reflector is arranged parallel with it, and contains the same arrangement of wires. Not one word of testimony was offered by respondent to indicate that any particular problem was involved in this application of the well known reflector formula, or that the result obtained differed in any respect from what one would expect.

In consequence, regardless of all other issues in the case, claim 16 of the patent, which on its face differs from claim 15 only by adding to claim 15 a second antenna as a reflector to thereby make the claim for an alleged *combination* of angle determination and reflector, is invalid.<sup>26</sup>

*Lincoln Engineering Co. v. Stewart-Warner*, 303 U. S. 455;  
*Powers-Kennedy Contracting Corp. v. Concrete M. & C. Co.*, 282 U. S. 175.

With the foregoing introduction we now take up a consideration of the prior antenna art.

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<sup>26</sup> Claim 16 of the Carter patent adds the reflector feature to claim 15 by the words:

"and, a similar parallel pair of conductors spaced an odd number of quarter wave lengths away from said first mentioned pair along the bisector of the angle of the conductors".

It is interesting to note that in the first Lindenblad patent originally in suit (No. 1,884,006) claim 26 (Vol. II, p. 484), one of the claims in suit, similarly differed from claim 25, also in suit, by the addition to claim 25 of the words:

"a similar pair of conductors are provided, the conductors of said similar pair being arranged parallel to the respective conductors of the first pair whereby the directional effect of the system is augmented".

**The Abraham 1898 and 1901  
Articles (Vol. II, pp. 761-784).**

As we have seen, Carter's alleged contribution over the Lindenblad Patent No. 1,927,522 was the ability to determine the *exact* value of the angle of the V. The formula for determining this is old with Abraham who was dealing with the very problem which was before Carter, namely, the direction of radiation from an antenna. Abraham's article of 1898 (Vol. II, p. 768) contains the formula which occurs on page 2, lines 60 and 70 of the Carter patent (Kelley, Vol. I, Q414, p. 229).

In the 1901 Abraham article (Vol. II, p. 777) the same formula is given, and this time it happens to be for the field strength rather than for the power, that is to say, it is in the *same* form as given by Carter, *and Abraham, like Carter, uses the Greek letter Theta to designate the angle.*

Kelley pointed out that there is no difference between Carter and Abraham, either in expression, meaning, significance or application (Qs. 425-432, Vol. I, p. 235). Carter merely copied Abraham's formula.

There was no denial of or rebuttal to this evidence.

Not only Abraham's formula but his general principle of considering the problem is used *in toto* by Carter, the text in the patent being merely a paraphrase of the Abraham articles.

In answer to Q435, Vol. I, p. 237, Kelley pointed out that the empirical equation given in line 85, page 2 of the third Carter patent, and in claims 15 and 16, is obtained merely by plotting the Abraham formula, and he summarizes (Q434, Vol. I, p. 237) :

"the empirical formula comes from this, having drawn a curve, smooth curve, through these points, in other words, disregarding whether or not anything

happens in between these points to which the formula doesn't apply, but merely drawing a smooth curve through these points, then by methods well known to engineers, deriving a curve, an equation, rather, which fits the curve as near as possible, practically. And the result of that is the empirical formula given on page 2, line 85."

Every engineer knows how to work out an empirical formula from a general formula such as is given by Abraham.

**French patent to Béthenod of 1925  
No. 596,737 (Vol. II, p. 824).**

Kelley pointed out (Vol. I, pp. 245 *et seq.*), that this patent discloses a short wave directional antenna system, consisting of linear conductors a plurality of half wave lengths long.

The conductors may be arranged parallel to each other or, as expressly stated, *inclined at an angle to each other*, that is, in the form of a V.

The patent states (Vol. II, p. 826) that the antenna wires may be

*"inclined not only with respect to the ground, but also with respect to one another so as to obtain directional effects either in the horizontal plane, or in the vertical plane, or in both planes."*

Since the angle must be chosen in accordance with the well known Abraham formula to insure best radiation in the desired direction, one skilled in the art, reading Béthenod's instructions, would obviously employ it. There is, therefore, no patentable difference between Carter and Béthenod.

**French patent to Béthenod of 1927  
No. 625,293 (Vol. II, p. 828).**

Kelley's testimony as to this patent will be found in Vol. I, pp. 247 *et seq.* The patent states:

“The object of the present invention is an antenna arrangement which is particularly advantageous in communicating by means of short waves.”

“The portion B, C of the antenna *may form an angle d of any value from 0 to 90° with the horizontal.*”

“In order to obtain the greatest radiation efficiency for the antenna, the length of B, C should preferably be equal to *a whole number of half wave lengths.*”

Kelley showed (Q464, Vol. I, pp. 248 *et seq.*) that this reference contains the same teaching as the Carter patent.

**French patent to Levy No. 593,570 of 1925  
(Vol. II, p. 862) and the addition thereto  
No. 30,798 of 1926 (Vol. II, p. 867).**

Kelley first discussed the patent of addition (beginning at Vol. I, p. 250) pointing out that it discloses a short wave directional type antenna system in which the wires of the V are in a *horizontal* plane, open ended, and of opposite polarity—hence of the *standing wave* type of the Carter patent.

Kelley's discussion of the original patent is found at page 251, and he there points out (quoting from the patent) that its teaching and the antenna structures therein shown and described are, in all essential respects, the same as defendant's antennas. Kelley, in answer to Q474 (p. 252)

quoted at length from the middle of page 2 of the translation of this patent (Vol. II, p. 862), and pointed out that its language explains the directional radiation that is obtained from petitioner's antennas as clearly shown in Exhibits S and T (Vol. II, pp. 745, 746).

As both Kelley<sup>27</sup> and Pratt<sup>28</sup> testified, in all of petitioner's antennas radiation is propagated at a substantial angle to the horizontal so as to impinge at the correct angle on the Heaviside layer. This is the deciding factor in the directional characteristics of petitioner's antennas. In this respect petitioner departs from the teachings of the Carter patent in suit, and follows the teaching of Levy. This teaching of Levy is emphasized by his summary of Patent No. 593,570 (Vol. II, p. 864), where he states:

"A method for long distance transmission of Hertzian radiant energy, characterized by:

(1) The transmission of horizontal electric field waves *to favor the reflection without loss on the Heaviside layer and on the ground* and the propagation through space.

(2) The energy transmitted presents a maximum in the vertical plane perpendicular to the axis of the radiator.

(3) The energy is transmitted *in the form of an inclined pencil* accepting as the plane of symmetry the vertical plane perpendicular to the axis of the radiator".

This is a complete definition of the directional radiation that is obtained from petitioner's antennas as clearly shown in Exhibits S and T (Vol. II, pp. 745, 746).

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<sup>27</sup> Vol. I, Qs. 292-298, pp. 208, 209.

<sup>28</sup> Vol. I, p. 203, fol. 289.

**The Carter patent is invalid in view of  
the Lindenblad V Antenna patent alone.**

As we have hereinbefore pointed out (*ante*, p. 20) the alleged improvement of Carter over the Lindenblad patent, as expressly asserted by Carter in his file wrapper (in the endeavor to overcome the Lindenblad patent cited by the Examiner of the Patent Office as an anticipation) consisted *solely* of the application of the old Abraham formula to determine the *precise* angle of the old V.

Since V antennas were old in Lindenblad, as well as with others, and since the art knew that the wires of the antenna *must* be arranged in accordance with the Abraham formula for best radiation, regardless of the manner in which they are arranged with respect to each other, the Carter patent is devoid of any novelty or patentable subject matter.

**Prior Invention by Bruce.**

There was another defense raised in the District Court which consisted of prior invention by an engineer named Bruce, employed by the American Telephone and Telegraph Company. Bruce's work antedated the Carter patent by many years. Because the Carter patent is so obviously invalid for the reasons already discussed, and, regardless of its validity, is so foreign to petitioner's antennas, no specific mention of Bruce's prior invention was made in the petition for writ of certiorari. In consequence, no specific consideration of Bruce's work will be here undertaken, notwithstanding the fact that reference thereto was made in respondent's memorandum in opposition to the petition for writ of certiorari.

However, it should be noted that Bruce's work was established in detail by contemporaneous documentary records, by four engineers of the Telephone Company (besides Bruce himself), and as a result the Trial Judge, in finding want of infringement in the case, accepted Bruce's work as constituting "prior art", stating (Vol. II, p. 1156, fol. 1379):

"All of defendant's antennas differ from the angle specified by Carter, and while the difference is not great, it is as great as the difference between Bruce (of the prior art) and Carter."

The Court of Appeals, again without reference to the record, lightly waived aside Bruce's work as "abandoned efforts" in the face of the fact that it was as a result of this work of Bruce that the highly efficient trans-oceanic radio telephone antennas of the American Telephone and Telegraph Company, in commercial use today in the principal countries of the world, resulted therefrom.

#### **Summary as to Prior Art.**

It is submitted that the prior art above reviewed establishes beyond question that the Carter patent was completely anticipated by and devoid of any patentable novelty over the prior art.

#### **The Opinion of the Court of Appeals on the Prior Art.**

The Court of Appeals ignored the anticipating effect of the prior Lindenblad V antenna patent as well as the other prior patents.

With respect to the Abraham articles, the Court of Appeals stated (Vol. II, p. 1174, fol. 1411):

*"The Abraham articles of 1898 and 1901 with the formula suggested, although 30 years old, had never been utilized. From that time was the entire period of the development of the radio art. While his formulas unquestionably had useful scientific interest to radio engineers, they failed to teach how to construct a directive antenna."*

The Abraham articles did not merely suggest the formula—they gave the exact formula that Carter copied. Moreover, this formula is not merely a matter of scientific curiosity. Plaintiff's Exhibit 20 (Vol. II, p. 538), the I. R. E. article written by Carter and his associates, Hansel and Lindenblad, specifically refers to Abraham's work, which was, in fact, utilized by them in the antenna operations therein described.<sup>29</sup> Not only do these facts completely expose the error on the part of the Court of Appeals, but there is not one word of evidence in the record to support the Court's wholly erroneous assertion that the Abraham formula "failed to teach how to construct a directive antenna". The evidence is directly to the contrary.

#### **Additional Comments on the Opinion of the Court of Appeals.**

While elsewhere herein we have made comment on specific statements in the opinion of the Court of Appeals, in connection with our discussion of the specific subject matter to which those portions of the opinion were directed,

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<sup>29</sup> In addition, reference to the first Lindenblad patent No. 1,884,006 (Vol. II, p. 470) shows the angle of predominant radiation from the antenna wires identified by the Greek letter alpha, which respondent's expert admitted corresponded to the angle determined by the formula of the Carter patent, and which, in turn, as we have seen, and is now admitted, is the Abraham formula (Vol. I, pp. 167, 170, see particularly XQ592, p. 170).

we here desire to comment upon several erroneous general assertions of the Court on which its ultimate conclusion was based.

1. For example, the Court of Appeals stated (Vol. II, p. 1168, fol. 1402) :

"No successful use of any other directional wireless is referred to until antennas made under the patents here to be considered were built."

Undoubtedly the Court's opinion of validity for the patent was predicated upon this erroneous belief. The entire want of factual or record support for this statement is found in the fact that directional antennas were concededly old in the art. The first Carter patent in suit, applied for in 1923, was for such antenna, and as respondent's expert Hogan admitted (Vol. I, p. 164), directional antennas were old even at that time. Of course, directional transmission of long waves preceded this work by many years.

Moreover, it should be noted that the express purpose of Abraham's scientific investigation was to determine the direction of radiation.

Finally, with reference to the Court's implication in the foregoing quoted portion of its opinion that the Carter patent discloses the first "successful" directive antenna, we again point out that the patent, on its face, as experts on both sides agree, is expressly directed to antennas which radiate *in the plane of the wires*. The Court of Appeals itself states (Vol. II, p. 1172) that long distance, short wave transmission is *not*, in fact, commercially carried on *in the plane of the wires*. In effect, therefore, the Court of Appeals in one breath has sustained as valid a patent for something which it states in the next breath is of no utility.

We are not here dealing with an illiterate or unskilled inventor. To the contrary, we are dealing with a patentee of recognized standing in the radio art, who, aided by highly skilled patent solicitors and counsel, in spite of the initial position of the Patent Office Examiner, after extensive argument and numerous oral interviews, secured a patent on the theory that:—although short wave directive antennas were *old*, it was *new* to produce an extreme concentration of the radiation *within the plane of the wires and along the axis of the V*, by selecting the *precise* angle for each *exact* length of antenna wire *if* it was of an integral number of half wave lengths. For that, and nothing else, the patent issued. Now that it has been demonstrated that even if such an arrangement were novel it would be utterly useless, the Court of Appeals has broadened the patent and has included within it all *practical* antennas to which the patent did not and could not apply, and has *excluded* from the patent the only antennas to which the patent on its face is directed, *viz*: one in which radiation is confined to the plane of the wires.

2 The Court of Appeals further said (Vol. II, p. 1169):

“Although the theory of operation of a single wire had been previously developed prior to Lindenblad and Carter, no one had found how the theory could be utilized in the solution of the problem of constructing a highly directive antenna.”

Here, again, the error of the Court of Appeals is so palpable as to require but little comment beyond what has been said above. There is not one word of evidence to this effect in the record in the case, and the prior Carter patent, applied for in 1923, as well as both of the prior Lindenblad patents, constitute complete, unarguable refutation to the Court’s statement.

***Conclusion.***

The Carter patent, in the light of the evidence in this case, is a wholly worthless thing, used by no one, not even by respondent who here asserts it. It is directed to a theory which *is* not, and according to even the Court of Appeals below, *could* not be used practically. It is neither valid nor infringed by petitioner's antennas. The Trial Judge was correct in so holding, and his findings were amply supported by the evidence. The Court of Appeals committed error, under these circumstances, in reversing the findings of the Trial Judge and in holding the Carter patent to be either valid or infringed.

In consequence, the decision of the Court of Appeals should be reversed.

Respectfully submitted,

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**APPENDIX.**

SEC. 4888. Before any inventor or discoverer shall receive a patent for his invention or discovery, he shall make application therefor, in writing, to the Commissioner of Patents, and shall file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same; and in case of a machine, he shall explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions; and he shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim shall be signed by the inventor.

SEC. 4892. The applicant shall make oath that he does verily believe himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever before known or used; and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public judge, or magistrate having an official seal and authorized to administer oaths in the foreign country in which the applicant may be, whose authority shall be proved by certificate of a diplomatic or consular officer of the United States.